

淡江大學 100 學年度碩士班招生考試試題

47-1

系別：機械與機電工程學系 科目：材 料 力 學

考試日期：2月28日(星期一) 第2節

本試題共 四大題， 二頁

1. The steel rod shown in Figure 1 has a diameter of 4 mm. It is attached to the fixed wall at A , and before it is loaded, there is a gap between the wall at B' and the rod of 1 mm. Determine the reactions at A and B' if the rod is subjected to an axial force of $P=20$ kN as shown. Neglect the size of the collar at C . Assume $E_{steel}=200$ GPa.

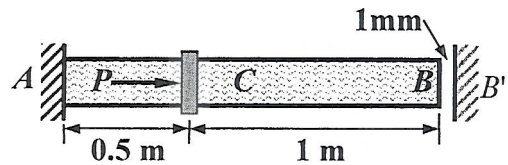


Figure 1

2. A simply supported beam of rectangular cross section is subjected to a concentrated load $P=10$ kN at its midspan as shown in Figure 2. Calculate the principal stresses at points A , B , C , D , and E of the beam.

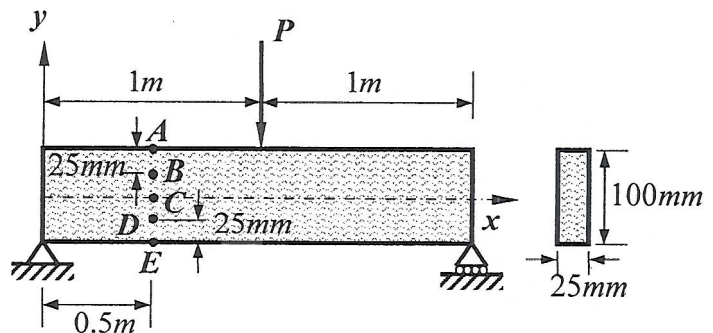


Figure 2

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3. The cantilever beam AB has a uniform load of intensity q acting over part of its length as shown in Figure 3. Determine the deflection δ_B and the angle of rotation θ_B at the free end. EI is constant.

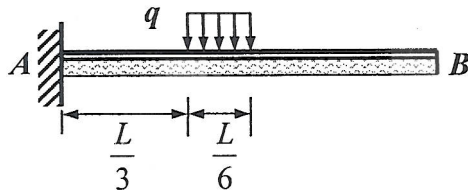


Figure 3

Hint:

The hint diagram shows a cantilever beam fixed at point A on the left and free at point B on the right. The total length of the beam is a. A point load P is applied at the free end B. The distance from the fixed support A to the load P is a, and the remaining length to the right is b.

$$\delta_B = \frac{Pa^2}{6EI}(3L - a), \theta_B = \frac{Pa^2}{2EI}$$

4. A steel shaft is to transmit 3.7 kW of power while rotating at a frequency of 60 Hz. Determine the shaft diameter which should be used if the shearing stress is not to exceed 50 MPa.